



Three new species of *Conostigmus* from China and redescription of *Conostigmus ampullaceus* Dessart, 1997 (Hymenoptera, Megaspilidae)

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Abstract

Three new species of *Conostigmus* Dahlbom, 1858 (Hymenoptera: Megaspilidae), *Conostigmus quadripetalus* Wang & Chen, **sp. nov.**, *Conostigmus electrinus* Wang & Chen, **sp. nov.**, *Conostigmus acutus* Wang & Chen, **sp. nov.** are characterized and illustrated from China. *Conostigmus ampullaceus* Dessart, 1997 is redescribed on the basis of 17 specimens and genitalia pictures are provided for the first time.

Keywords

Ceraphronoidea, morphology, parasitoid wasps, taxonomy

Introduction

Conostigmus Dahlbom, 1858 is the richest genus of parasitoid wasps of Megaspilidae, comprises more than 170 species and has a worldwide distribution (Johnson and Musetti 2004; Trietsch et al. 2015; Trietsch et al. 2020). Most species have been recorded from the Palearctic region (Mikó et al. 2016). However, only five species have been recorded from China: *C. abdominalis* Boheman, 1832 from Zhejiang and Shanghai, *C. ampullaceus* Dessart, 1997 and *C. villosus* Dessart, 1997 from Taiwan, *C. xui* Cui & Wang, 2023 from Guangdong (Dessart 1997; Fu et al. 2021; Cui et al. 2023), *Conostigmus nankunensis* Qian & Wang, 2024 from Guangzhou (Qian et al. 2024).

Conostigmus was first described by Dahlbom (1858), who originally proposed it as a subgenus of *Megaspilus* Westwood, 1829. Kieffer (1909) recognized *Conostigmus* as a genus separate from *Megaspilus*. Species of *Conostigmus* can be difficult to distinguish from its sister genus, *Dendrocerus*, due to the numerous exceptions and overlap between these two genera. The combination of characters to distinguish these two genera are as follows: the ocelli of male *Dendrocerus* form an obtuse ocellar triangle whereas the ocelli of male *Conostigmus* usually form an acute or equilateral ocellar triangle; the sternaulus is consistently absent in *Dendrocerus* but may be present or absent in *Conostigmus*. Wings are never absent in *Dendrocerus*, whereas in *Conostigmus*, they may be present or absent. The posterior end of the notauli is always adjacent to the transscutal articulation in *Conostigmus*, whereas in some *Dendrocerus*, it is not. When it comes to male genitalia, the parossiculi are fused with the gonostipes in *Dendrocerus* but never in *Conostigmus*. Additionally, the medioventral conjunctiva of the gonostyle–volsella complex differs: in *Dendrocerus*, the parossiculi are never independent, but in *Conostigmus*, they may be either independent or fused (Dessart 1985, 1995a, 1995b, 1999, 2001; Mikó et al. 2011, 2013; Trietsch et al. 2020).

Conostigmus are known to be associated with Hymenoptera, Coleoptera, Diptera and Mecoptera, but relative to its diversity, little is known about the life history of *Conostigmus* (Graham 1984; Trietsch et al. 2016). Currently, there are only a few breeding records for *Conostigmus* species, i.e., *Conostigmus obscurus* Thomson, 1858 (*C. syrphorum*) reared from a syrphid puparium (Kieffer 1907); *Conostigmus triangularis* (Thomson, 1858) and *Conostigmus timberlakei* Kamal, 1926 reared from pupae of Aphididae (Kamal, 1926); *Conostigmus rufescens* Kieffer, 1907 parasitised eggs and larvae of the pod fly *Dasineura brassicae* (Diptera: Cecidomyiidae) (Laborius 1972; Vidal 2003; Trietsch et al. 2015).

In this paper, we described three new species of *Conostigmus*, *C. quadripetalus* Wang & Chen, sp. nov., *C. electrinus* Wang & Chen, sp. nov., *C. acutus* Wang & Chen, sp. nov. and redescribed one known species, *C. ampullaceus* Dessart, 1997. We also provide a key to males of Chinese *Conostigmus* to aid identification efforts in the future.

Materials and methods

Specimens were collected by using Malaise traps and yellow pan traps. They were mounted on point-cards. Photographs were taken with a Leica M205A stereomicroscope and a Leica DFC-500 digital camera, with extended focusing software. Measurements are given in microns. Plates were created using Adobe photoshop CS3. To prepare male genitalia for study, apical metasomal segments were removed from specimens and placed in 35% NaOH solution, heated in a water bath at 100 °C for 8 min and then transferred to a droplet of glycerin on a concavity slide. Dissections were performed in glycerin using #5 forceps and #2 insect pins. Genitalia were stored in glycerin after dissection.

The types are deposited in AHNU (Auhui Normal University, Anhui, China) and SCBG (South China Botanical Garden, Chinese Academy of Sciences). Morphological terminology and Genitalia terminology follow Mikó and Deans (2009) and Trietsch et al. (2020).

Abbreviations used in the text are as follows: **F1, F2, ..., F9**: Flagellum 1, 2, ..., F9. **LOL**: Lateral ocellar length, shortest distance between inner margins of median and lateral ocelli. **OOL**: Ocular ocellar length, minimum distance between a posterior ocellus to the eye margin. **POL**: Posterior ocellar length, shortest distance between inner margins of posterior ocelli. **HH**: Head height, lateral view. **EHf**: Eye height, anterior view. **HL**: Head length. **HW**: Head width. **IOS**: Interorbital space. **AscW**: Anterior mesoscutal width. **PscW**: Posterior mesoscutal width. **S9**: ninth abdominal sternite.

Taxonomy

Key to species of *Conostigmus* from China (male)

- 1 Mesosoma 2–2.1 times longer than wide; Preoccipital furrow absent
..... *C. ampullaceus* Dessart, 1997
- Mesosoma at most 1.5 times longer than wide; preoccipital furrow present 2
- 2 Preoccipital furrow ends posterior to ocellar triangle
..... *C. quadripetalus* Wang & Chen, sp. nov.
- Preoccipital furrow ends inside ocellar triangle, but ends posterior to the anterior ocellus 3
- 3 Facial sulcus present 4
- Facial sulcus absent 5
- 4 Harpe longer than the gonostipes in lateral view
..... *C. abdominalis* Boheman, 1832
- Harpe slightly shorter than gonostipes in lateral view
..... *C. nankunensis* Qian & Wang, 2024
- 5 Basal gastral carinae reaching 1/3 of syntergum length 6
- Basal gastral carinae reaching 1/4 of syntergum length 7

- 6 Head and mesosoma black, scape light-coloured, the rest of antennae black; pterostigma length vs. width: 2.5 ***C. villosus* Dessart, 1997**
- Head and mesosoma reddish brown, metasoma and antennae amber; pterostigma length vs. width: 3.7–4.5 ***Conostigmus electrinus* Wang & Chen, sp. nov.**
- 7 Body length less than 2 mm; sternaulus present and equal to mesopleuron length at level of sternaulus ***Conostigmus acutus* Wang & Chen, sp. nov.**
- Body length more than 2 mm; sternaulus present and exceeding 2/3 of mesopleuron length at level of sternaulus ***C. xui* Cui & Wang, 2023**

***Conostigmus ampullaceus* Dessart, 1997**

Species comments and history. *Conostigmus ampullaceus* were first described by Dessart in 1997, who illustrated the male and female antennae, wings and male head, mesosoma and metasoma for the first time. However, the morphological characteristics were represented by hand drawings, without records of the male genitalia or pictures of the female head, mesosoma, and metasoma. The present paper redescribes male and female, adds descriptions of the male genitalia and color photos of both male and female. Furthermore, this article is the first to describe the syntergal translucent patch.

Material examined. CHINA • 16 males, 1 female. (AHNU) • 4 males: Guangxi, Xingan, Kitten Mountain, 1900 m, yellow pan traps, 26.VI–27.VI.2011, Nasen Wei, SCAU 3045398, SCAU 3045397, SCAU 3045396, SCAU 3045395; (AHNU) • 4 males: Guangxi, Xingan, Kitten Mountain, 1900 m, yellow pan traps, 26.VI–27.VI.2011, Nasen Wei, SCAU 3045394, SCAU 3045393, SCAU 3045392, SCAU 3045392; (AHNU) • 8 males: Guangxi, Xingan, Kitten Mountain, 1900 m, yellow pan traps, 26.VI–27.VI.2011, Nasen Wei, SCAU 3045399, SCAU 3045391, SCAU 3045390, SCAU 3045389, SCAU 3045388, SCAU 3045387, SCAU 3045386, SCAU 3045385; (AHNU) • 1 female: Guangxi, Xingan, Kitten Mountain, 1900 m, yellow pan traps, 26.VI–27.VI.2011, Nasen Wei, SCAU 3045599.

Diagnosis. Head black, mesosoma and metasoma brownish black or reddish brown; body slender; mesosoma very narrow, about $1.8 \times$ longer than wide; metasoma $3.1 \times$ longer than wide ($2.5 \times$ in female); facial pit present; preoccipital furrow absent. sternaulus elongate and complete; syntergal translucent patch semi-circular; parossiculi fused with the gonostipes.

Redescription. Male. Body length: 1.6–2.4 mm.

Coloration. Colour hue pattern: head black; pronotum reddish brown; mesosoma and metasoma brownish black (propleuron and petiolus reddish brown); mandibles reddish brown and palps yellow; base of legs dark, rest of legs yellow; scape and pedicel reddish brown, F1–F9 black; pterostigma, costal vein, radial vein and marginal fringes of wings brown; body pubescence yellowish; male genitalia yellow. Color intensity pattern: mesosoma lighter than metasoma; mesosoma anterodorsally lighter than meso-metapleuron; scape and pedicel darker than legs.

Head (Fig. 1D, E). Head width, dorsal view: slightly wider than mesosoma (about $1.2 \times$ wider than mesosoma). Head width vs. head height: HW: HH = 0.8–1.0. Head

height vs. eye height: HH: EHf = 1.5–1.7. Head height vs. head length: HH: HL = 1.3–1.4. Head width vs. interorbital space: HW: IOS = 1.5–1.8. Lateral ocellar length: ocular ocellar length: LOL: OOL = 0.4–0.5. Lateral ocellar length: posterior ocellar length: LOL: POL = 0.6–0.7. Ocular ocellar length: posterior ocellar length: OOL: POL = 1.5–1.6. Head shape (anterior view): circular. Preoccipital lunula count: absent. Preoccipital carina count: absent. Preoccipital furrow count: absent. Occipital carina count: present. Occipital carina structure: complete and crenulate. Postocellar carina count: absent. Intertorular carina count: present. Intertorular area count: present. Intertorular carina shape: straight. Median process on intertorular carina count: absent. Median region of intertorular area shape: flat. Facial sulcus absent. Facial pit present. Ocellar foveae distinct, and ocellar foveae width equal to ocellus diameter.

Antennae (Fig. 1A). Scape length vs. pedicel length: 4.3–4.8. Scape length vs. F1 length: 1.1–1.3. F1 length vs. pedicel length: 3.3–4.1. Longest male flagellomere: F1. F1 length vs. F2 length: 1.2–1.3. Length of pubescence on flagellomere vs. flagellomere width: flagellomeres width about twice pubescence length.

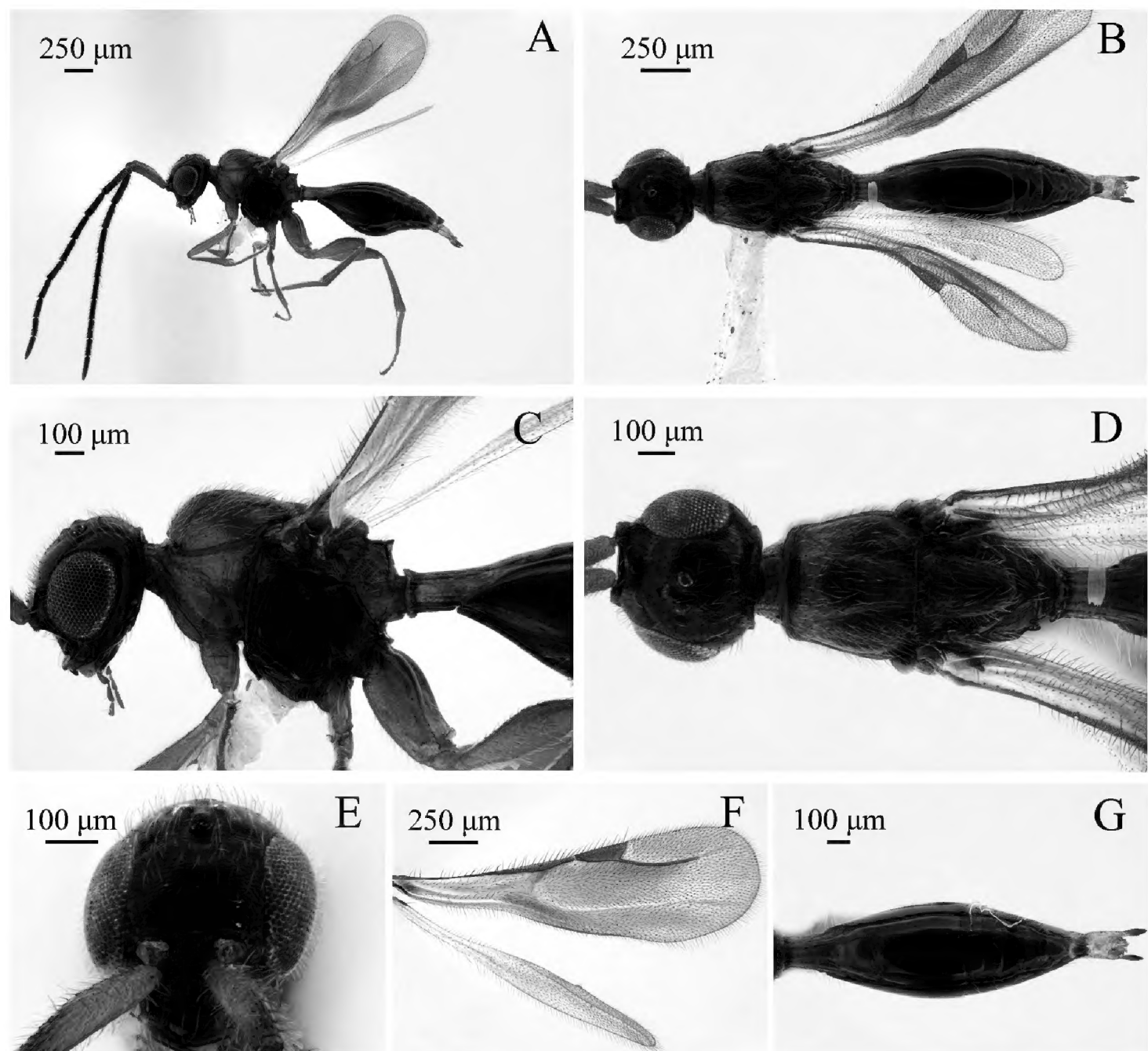


Figure 1. *Conostigmus ampullaceus* Dessart, 1997, male **A** lateral habitus **B** dorsal habitus **C** head and mesosoma, lateral view **D** head and mesosoma, dorsal view **E** head, anterior view **F** wings **G** metasoma, dorsal view.

Mesosoma (Fig. 1C, D). Mesosoma very narrow ($1.9 \times$ longer than wide) (Length/width/height = $820/408/618 \mu\text{m}$). AscW/PscW = $0.7\text{--}0.8$. Mesoscutum $1.1 \times$ wider than long (Length/width = $352/408 \mu\text{m}$). Transscutal articulation evident. Notaulus count: present and complete. Notaulus posterior end: adjacent to transscutal articulation, posterior end of notaulus contracted and adjacent to median mesoscutal sulcus. Median mesoscutal sulcus count: present and complete. Median mesoscutal sulcus posterior end: adjacent to transscutal articulation. Scutoscuteellar sulcus count: present. Scutoscuteellar sulcus shape: foveolate and adjacent to transscutal articulation. Mesoscutellum $1.6 \times$ longer than wide, and limited by a u-shaped carina. Sternaulus count: present. Sternaulus shape: elongate and complete. Pleural pit present. Mesopleural sulcus shape: straight. Lateral propodeal carina shape: inverted “Y”. Anteromedian projection of the metanoto-propodeo-metapecto-mesopectal complex present.

Wings (Fig. 1F). Forewing length: $1.5\text{--}1.8 \text{ mm}$, infusate. Forewing macropterous with apex extending past petiole. Forewing with translucent stripes and dense pubescence. Pterostigma triangular, length vs. width: $2.1\text{--}2.6$. Radius ($387 \mu\text{m}$), a little curved in the middle, longer ($1.5 \times$) than pterostigma. Hind wing without vein.

Metasoma (Fig. 1G). Metasoma $3.1 \times$ longer than wide (Length/width/height = $1204/386/500 \mu\text{m}$). Transverse carina on petiole shape: concave. Syntergum smooth, longer ($1.75 \times$) than wide. Gastral carinae present and less than $1/3$ of syntergum length. Syntergal translucent patch count: present. Syntergal translucent patch shape: semi-circular. Rest of tergites smooth, but with sparse hairs.

Male genitalia (Fig. 2). Proximodorsal notch of cupula count: absent. Distodorsal margin of cupula shape: concave. Harpe shape: simple and not bilobed. Distal margin of harpe shape: shrinking to an acute angle. Harpe orientation: dorsomedial. Harpe shorter than gonostipes. Lateral setae of harpe count: present. Lateral setae of harpe orientation: oriented distally. Dense patch of setae on the distoventral edge of the harpe count: present. Parossiculus count or parossiculus and gonostipes fusion: present and parossiculi fused with the gonostipes. Gonossiculus and gonossiculus spine present. Gonossiculus spine length: one spine not more than $2 \times$ as long as the other (s) (spines of similar lengths). Penisvalva curved proximally.

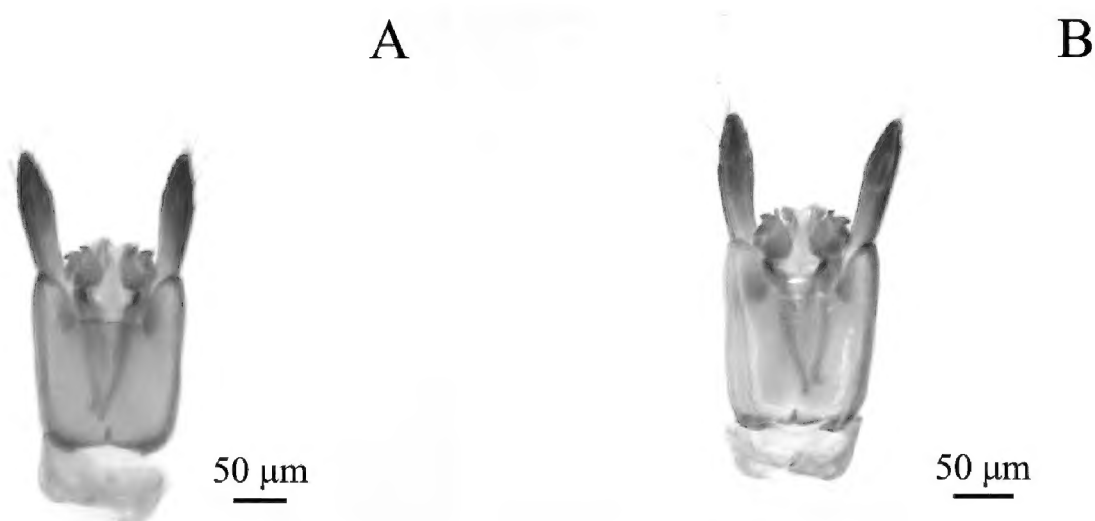


Figure 2. *Conostigmus ampullaceus* Dessart, 1997, male, genitalia **A** ventral view **B** dorsal view.

Female (Fig. 3). Body length: 2.0 mm. Mesosoma and metasoma reddish brown; scape, pedicel yellow; F1–F9 from yellow to black. Lateral ocellar length: ocular ocellar length: LOL: OOL = 0.6. Ocular ocellar length: posterior ocellar length: OOL: POL = 1.1. Scape length longer than the sum of pedicel, F1, F2 and F3. Forewing length: 1.4 mm; Pterostigma length vs. width: 4.6. Radius (270 μ m), a little curved in the middle, longer (1.4 \times) than pterostigma. Metasoma 2.5 \times longer than wide (Length/width/height = 1150/468/480 μ m). The rest of the characteristics are the same as the males.

Distribution. China (Taiwan, Guangxi).

Biology. Unknown.

Differences between Taiwan and Guangxi populations. *Conostigmus ampullaceus* was previously recorded in Taiwan, and this article adds a new distribution record in Guangxi. No differences were found between Taiwan and Guangxi populations.

Differences between males and females. Male and female differences are reflected in sexual dimorphism in the antennae and different genitalia.

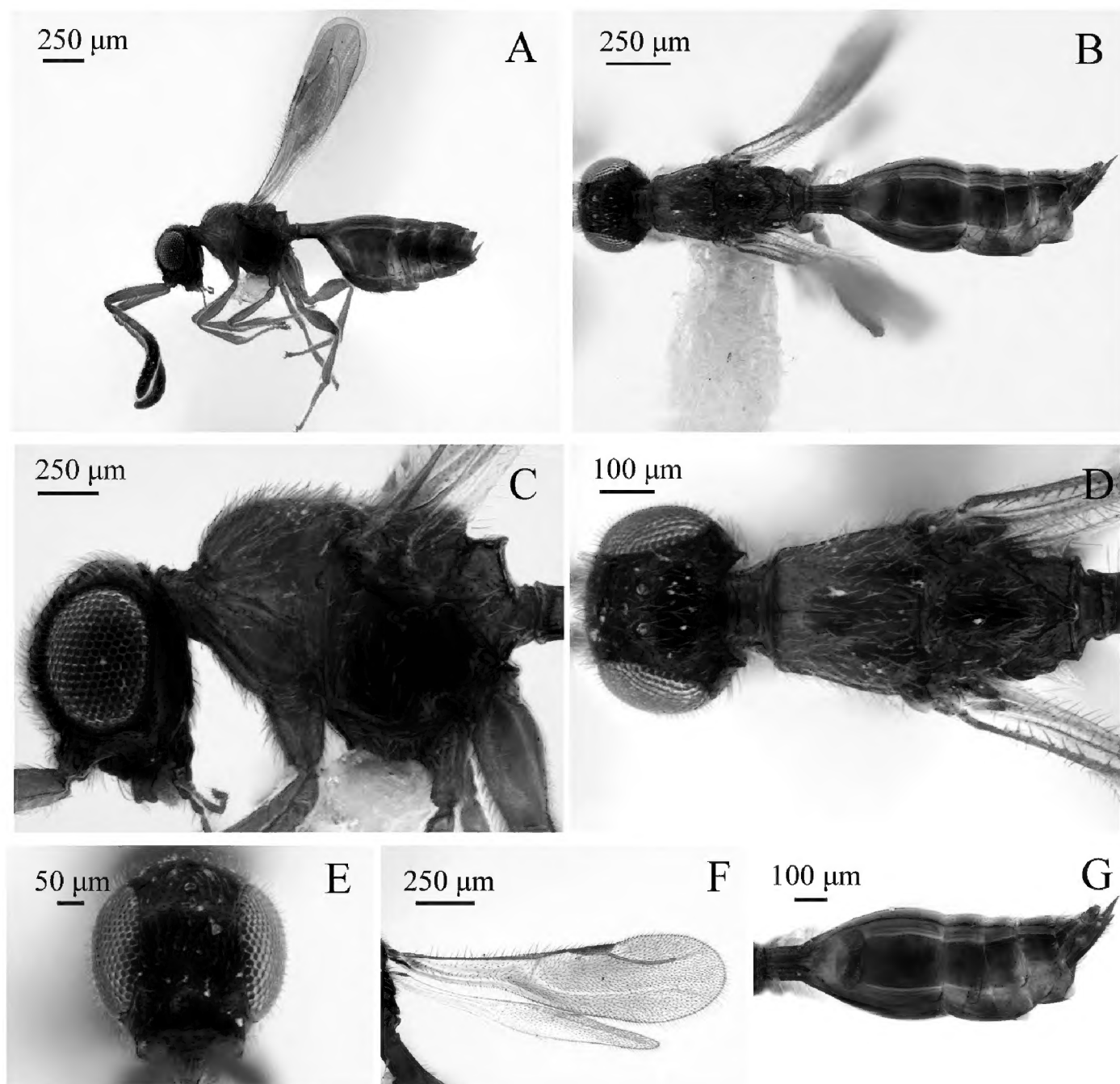


Figure 3. *Conostigmus ampullaceus* Dessart, 1997, female **A** lateral habitus **B** dorsal habitus **C** head and mesosoma, lateral view **D** head and mesosoma, dorsal view **E** head, anterior view **F** wings **G** metasoma, dorsal view.

***Conostigmus acutus* Wang & Chen, sp. nov.**

<https://zoobank.org/95EA8A38-BE98-45FA-89C5-6399A20CA735>

Material examined. *Holotype*: (AHNU) • male **CHINA:** Shanxi, Lishan National Nature Reserve, Dahe Protection Station, Malaise traps, 22–26.VIII.2012, Yajun You, SCAU 3045598. ***Paratype*:** (SCBG) • 1 male: same collection information as preceding, SCAU 3045597.

Diagnosis. Head and mesosoma coarsely sculptured, metasoma smooth; randomly sized impressions around setal pits present and larger than scutes; median process on intertorular carina present and acute; mesoscutellum length almost equal to width; sternaulus present and complete; anteromedian projection of the metanoto-propodeo-metapecto-mesopectal complex absent; gastral carinae present and reaching 1/4 of syntergum length; male S9 distal setae composing setiferous patches; distal margin of harpe in lateral view acute or straight; Gonossiculus spine count: 2.

Description. Male. Body length: 1.5–1.6 mm.

Coloration. Colour hue pattern: head and mesosoma black (pronotum and propleuron reddish brown); metasoma brownish black (petiolus reddish brown); mandibles reddish brown and palps yellow; legs yellow; scape yellow; pedicel and F1–F9 brown; pterostigma, costal vein, radial vein and marginal fringes of wings brown; body pubescence yellowish; male genitalia yellowish. Color intensity pattern: scape darker than legs.

Head (Fig. 4D, E). Head width, dorsal view: slightly wider than mesosoma (about $1.05 \times$ wider than mesosoma). Head width vs. head height: HW: HH = 1.1–1.2. Head height vs. eye height: HH: EHf = 1.7–1.8. Head height vs. head length: HH: HL = 1.2–1.4. Head width vs. interorbital space: HW: IOS = 1.6–1.7. Lateral ocellar length: ocular ocellar length: LOL: OOL = 0.4–0.5. Lateral ocellar length: posterior ocellar length: LOL: POL = 0.6–0.7. Ocular ocellar length: posterior ocellar length: OOL: POL = 1.3–1.7. Head coarse; randomly sized impressions around setal pits count: present; the size of impressions around the setal pits on the head: impressions larger than scutes; head shape (anterior view): circular or triangular. Preoccipital lunula count: absent. Preoccipital carina count: absent. Preoccipital furrow count: present. Preoccipital furrow anterior end: preoccipital furrow ends inside ocellar triangle, but ends posterior to the anterior ocellus. Occipital carina count: present. Occipital carina structure: complete and crenulate. Postocellar carina count: present. Intertorular area count: present. Intertorular carina count: present. Median process on intertorular carina count: present. Median process on intertorular carina shape: acute. Median region of intertorular area shape: flat. Facial sulcus absent. Facial pit present. Ocellar foveae distinct, and ocellar foveae width equal to ocellus diameter.

Antennae (Fig. 4A). Scape length vs. pedicel length: 3.8–4.5. Scape length vs. F1 length: 1.2–1.3. F1 length vs. pedicel length: 3.1–3.5. Longest male flagellomere: F1. F1 length vs. F2 length: 1.0–1.2. F3 length almost equal to F4. F7 length almost equal to F8. Length of pubescence on flagellomere vs. flagellomere width: flagellomeres width about twice than pubescence length.

Mesosoma (Fig. 4C, D). Mesosoma roughness and slightly narrow ($1.3 \times$ longer than wide) (Length/width/height = 512/393/359 μm). AscW/PscW = 0.8–0.9. Mesoscutum

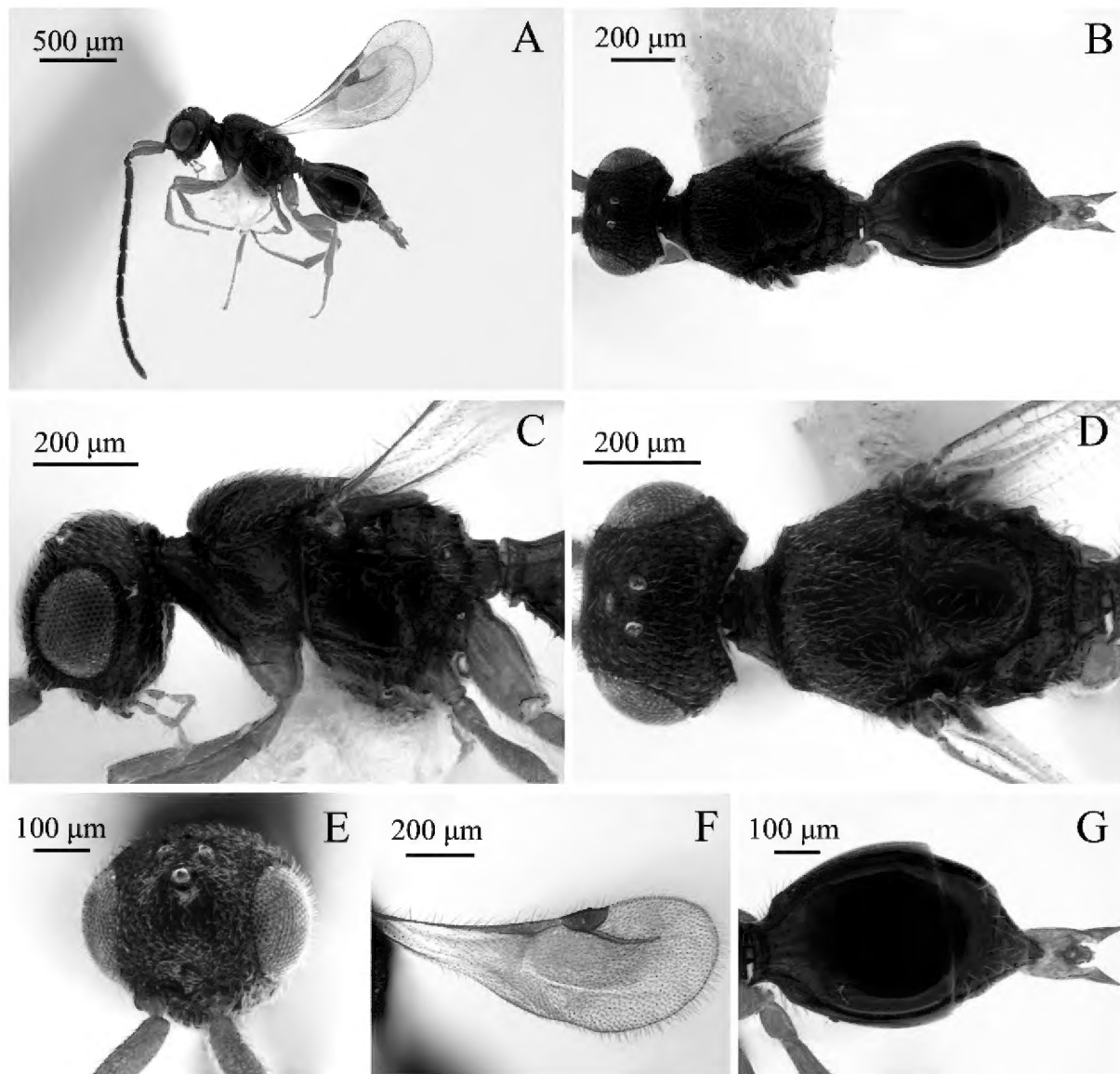


Figure 4. *Conostigmus acutus* Wang & Chen, sp. nov., male, holotype **A** lateral habitus **B** dorsal habitus **C** head and mesosoma, lateral view **D** head and mesosoma, dorsal view **E** head, anterior view **F** wings **G** metasoma, dorsal view.

1.8 × wider than long (Length/width = 222/393 μm). Transscutal articulation evident. Notaulus count: present and complete. Notaulus posterior end: adjacent to transscutal articulation, posterior end of notaulus contracted but not adjacent to median mesoscutal sulcus. Median mesoscutal sulcus count: present and complete. Median mesoscutal sulcus posterior end: adjacent to transscutal articulation. Scutoscutellar sulcus count: present. Scutoscutellar sulcus vs. transscutal articulation location: adjacent. Scutoscutellar sulcus shape: scutoscutellar sulcus angled medially, foveolate. Mesoscutellum length almost equal to width, limited by a u-shaped carina. Sternaulus count: present. Sternaulus shape: elongate and complete. Mesopleural sulcus shape: straight. Pleural pit present. Lateral propodeal carina shape: inverted “Y”. Anteromedian projection of the metanoto-propodeo-metapecto-mesopectal complex absent.

Wings (Fig. 4F). Forewing length: 1.1–1.4 mm, translucent. Forewing macrop-terous with apex extending past petiole. Forewing with translucent stripes and dense pubescence. Pterostigma semi-circular, length vs. width: 2.1–3.2. Radius (200 μm), a little curved in the middle, longer (1.4 ×) than pterostigma. Hind wing without vein.

Metasoma (Fig. 4G). Metasoma 1.6 × longer than wide (Length/width/height = 647/408/357 μm). Transverse carina on petiole shape: concave. Syntergum smooth,

longer ($1.1 \times$) than wide. Gastral carinae present and reaching $1/4$ of syntergum length. Syntergal translucent patch count: present. Syntergal translucent patch shape: long rod-shaped. Rest of tergites smooth, but with sparse hairs.

Male genitalia (Fig. 5). Distal margin of male S9 shape: convex. Proximolateral corner of male S9 shape: blunt. Male S9 distal setal line/setal patch count: distal setae composing setiferous patch or patches; distal setae composing transverse setiferous line or lines. Submedial projections on proximal margin of S9 count: absent. Harpe shape: acute triangle. Distal margin of harpe shape: shrinking to an much acute angle. Distal margin of harpe in lateral view: acute or straight. Harpe orientation: dorsomedial. Harpe length: harpe shorter than gonostipes in lateral view. Lateral setae of harpe count: present. Lateral setae of harpe orientation: oriented distally. Dense patch of setae on the distoventral edge of the harpe count: absent. Parossiculus count or parossiculus and gonostipes fusion: present and parossiculi not fused with the gonostipes. Gonossiculus and gonossiculus spine present. Gonossiculus spine count: 2. Gonossiculus spine length: one spine more than $2 \times$ as long as the other (s). Penisvalva curved proximally.

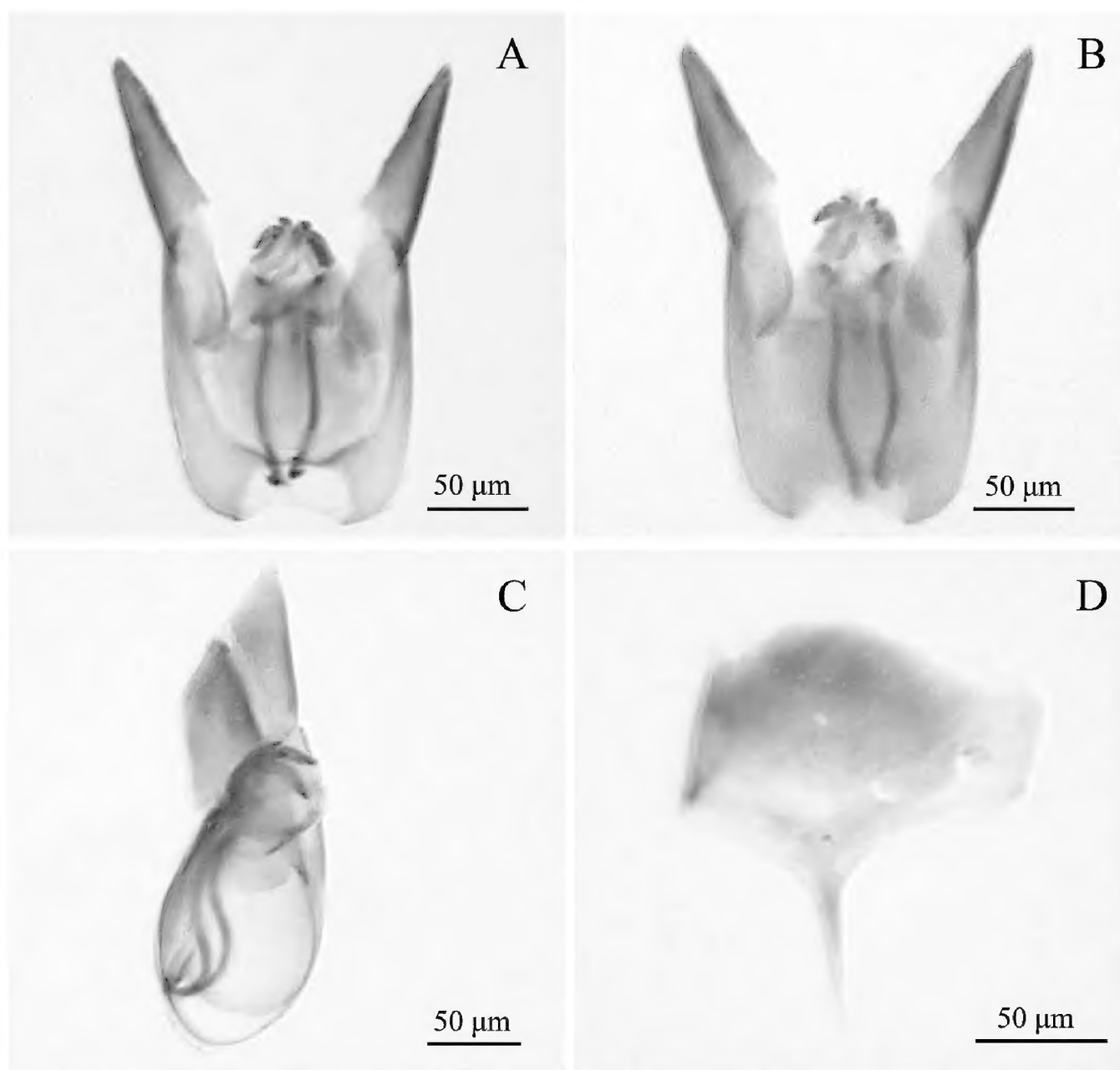


Figure 5. *Conostigmus acutus* Wang & Chen, sp. nov., male, holotype, genitalia **A** ventral view **B** dorsal view **C** lateral view **D** S9.

Distribution. China (Shanxi).

Biology. Unknown.

Etymology. Consistent with the genus name, the species name is a Latin masculine adjective meaning “mucronate”, indicating a male mucronate harpe.

***Conostigmus electrinus* Wang & Chen, sp. nov.**

<https://zoobank.org/21BD7BA8-1152-4941-ACB5-E5A3686169B5>

Material examined. Holotype: (AHNU) • male **CHINA:** Liaoning, Laotudingzi National Nature Reserve, yellow pan traps, 16–19.VII.2011, Huayan Chen & Kexin Zhao, SCAU 3045596. **Paratypes:** (AHNU) • 1 male, Liaoning, Laotudingzi National Nature Reserve, yellow pan traps, 16–19.VII.2011, Huayan Chen, SCAU 3045595; (SCBG) • 2 males: 1 male, same collection information as preceding, Pan Li, SCAU 3045594; 1 male, same collection information as preceding, Huayan Chen & Kexin Zhao, SCAU 3045593.

Diagnosis. This species is distinguished by the following combination of characters: head and mesosoma reddish brown; metasoma and antennae amber; scape length almost equal to F1; facial pit present; preoccipital furrow present; postocellar furrow absent; sternaulus present, elongate and reaching 1/2 of mesopleuron length at the level of the sternaulus; gastral carinae present and reaching 1/3 of syntergum length; syntergal translucent patch bending moon shape; harpe slightly shorter than gonostipes.

Description. Male. Body length: 2–2.2 mm.

Coloration. Colour hue pattern: head and mesosoma reddish brown; metasoma and antennae amber; mandibles reddish brown; palps and legs yellow; pterostigma, costal vein, radial vein and marginal fringes of wings light brown; body pubescence yellowish; male genitalia yellow. Color intensity pattern: head darker than mesosoma; antennae lighter than metasoma; petiole neck and anterior region of syntergite darker in coloration than the posterior region of the syntergite.

Head (Fig. 6D, E). Head width, dorsal view: slightly wider than mesosoma (about $1.3 \times$ wider than mesosoma). Head width vs. head height: HW: HH = 1.1–1.2. Head height vs. eye height: HH: EHf = 2.0–2.2. Head height vs. head length: HH: HL = 1.4–1.6. Head width vs. interorbital space: HW: IOS = 1.6–1.7. Lateral ocellar length: ocular ocellar length: LOL: OOL = 0.2–0.3. Lateral ocellar length: posterior ocellar length: LOL: POL = 0.4–0.45. Ocular ocellar length: posterior ocellar length: OOL: POL = 1.4–1.5. Head shape (anterior view): circular or triangular. Preoccipital lunula count: present. Preoccipital carina count: absent. Preoccipital furrow count: present. Preoccipital furrow anterior end: preoccipital furrow ends inside ocellar triangle, but ends posterior to the anterior ocellus. Preoccipital furrow sculpture: crenulate. Occipital carina count: present. Occipital carina structure: complete and crenulate. Postocellar carina count: absent. Intertorular area count: present. Intertorular carina count: present. Median process on intertorular carina count: absent. Median region of intertorular area shape: flat. Facial sulcus absent. Facial pit present. Ocellar foveae distinct, and ocellar foveae width equal to ocellus diameter.

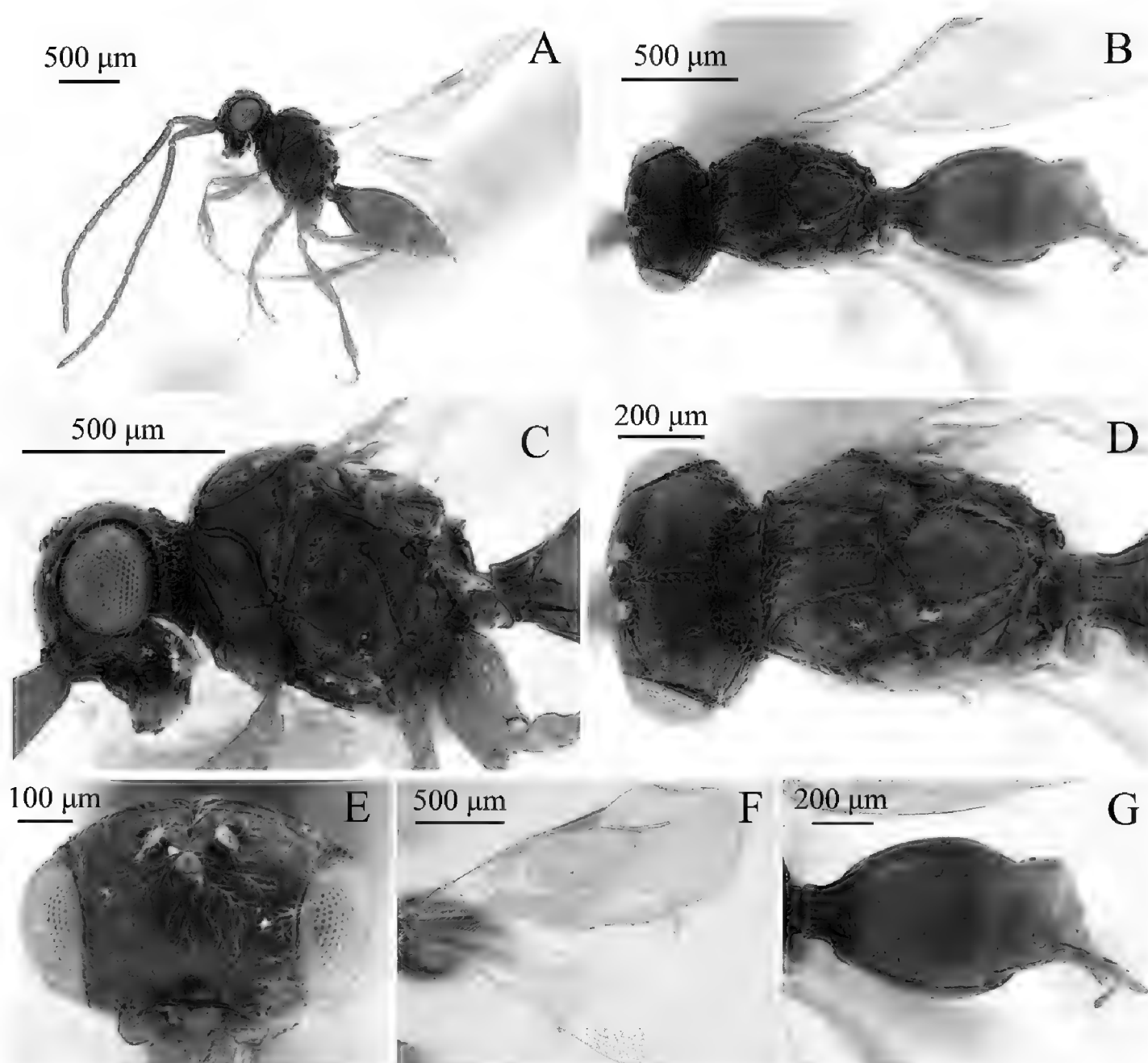


Figure 6. *Conostigmus electrinus* Wang & Chen, sp. nov., male, holotype **A** lateral habitus **B** dorsal habitus **C** head and mesosoma, lateral view **D** head and mesosoma, dorsal view **E** head, anterior view **F** wings **G** metasoma, dorsal view.

Antennae (Fig. 6A). Scape length vs. pedicel length: 5.1–5.6. Scape length almost equal to F1. F1 length vs. pedicel length: 5.0–5.3. Longest male flagellomere: F1. F1 length vs. F2 length: 1.2–1.3. Length of pubescence on flagellomere vs. flagellomere width: flagellomeres width about twice than pubescence length.

Mesosoma (Fig. 6C, D). Mesosoma slightly narrow ($1.4 \times$ longer than wide) (Length/width/height = 686/489/604 μm). AscW/PscW = 0.8–0.9. Mesoscutum $1.75 \times$ wider than long (Length/width = 227/489 μm). Transscutal articulation evident. Notaulus count: present and complete. Notaulus posterior end: adjacent to transscutal articulation, posterior end of notaulus not curved and not adjacent to median mesoscutal sulcus. Median mesoscutal sulcus count: present and complete. Median mesoscutal sulcus posterior end: adjacent to transscutal articulation. Scutoscuteellar sulcus count: present. Scutoscuteellar sulcus vs. transscutal articulation location: adjacent. Scutoscuteellar sulcus shape: scutoscuteellar sulcus angled medially, foveolate.

Mesoscutellum $1.3 \times$ longer than wide, limited by a u-shaped carina. Sternaulus count: present. Sternaulus shape: elongate and reaching $1/2$ of mesopleuron length at the level of the sternaulus. Mesopleural sulcus shape: straight. Pleural pit present. Lateral propodeal carina shape: inverted “Y”. Anteromedian projection of the metanoto-propodeo-metapecto-mesopectal complex absent.

Wings (Fig. 6F). Forewing length: 1.7–1.8 mm, translucent. Forewing macropterous with apex extending past petiole. Forewing with transparent stripes and dense pubescence (stripes without pubescence). Pterostigma triangular, length vs. width: 3.7–4.5. Radius (383 μm), a little curved, longer ($1.2 \times$) than pterostigma. Hind wing without vein.

Metasoma (Fig. 6G). Metasoma $2.1 \times$ longer than wide (Length/width/height = 1129/532/462 μm). Transverse carina on petiole shape: straight. Syntergum smooth, longer ($1.1 \times$) than wide. Gastral carinae present and reaching $1/3$ of syntergum length. Syntergal translucent patch count: present. Syntergal translucent patch shape: crescent. Rest of tergites smooth, but with sparse hairs.

Male genitalia (Fig. 7). Harpe shape: simple and not bilobed; finger shape. Distal margin of harpe shape: shrinking to an acute angle. Harpe orientation: dorsomedial. Harpe slightly shorter than gonostipes in lateral view. Lateral setae of harpe count: present. Lateral setae of harpe orientation: oriented distally. Dense patch of setae on the distoventral edge of the harpe count: absent. Parossiculus count or parossiculus and gonostipes fusion: present and parossiculi not fused with the gonostipes. Gonossiculus and gonossiculus spine present. Gonossiculus spine count: 3. Gonossiculus spine length: one spine not more than $2 \times$ as long as the other(s). Penisvalva curved and intersecting proximally.

Distribution. China (Liaoning).

Biology. Unknown.

Etymology. Consistent with the genus name, the species name is a Latin masculine adjective meaning “amber”, indicating amber antennae and metasoma.

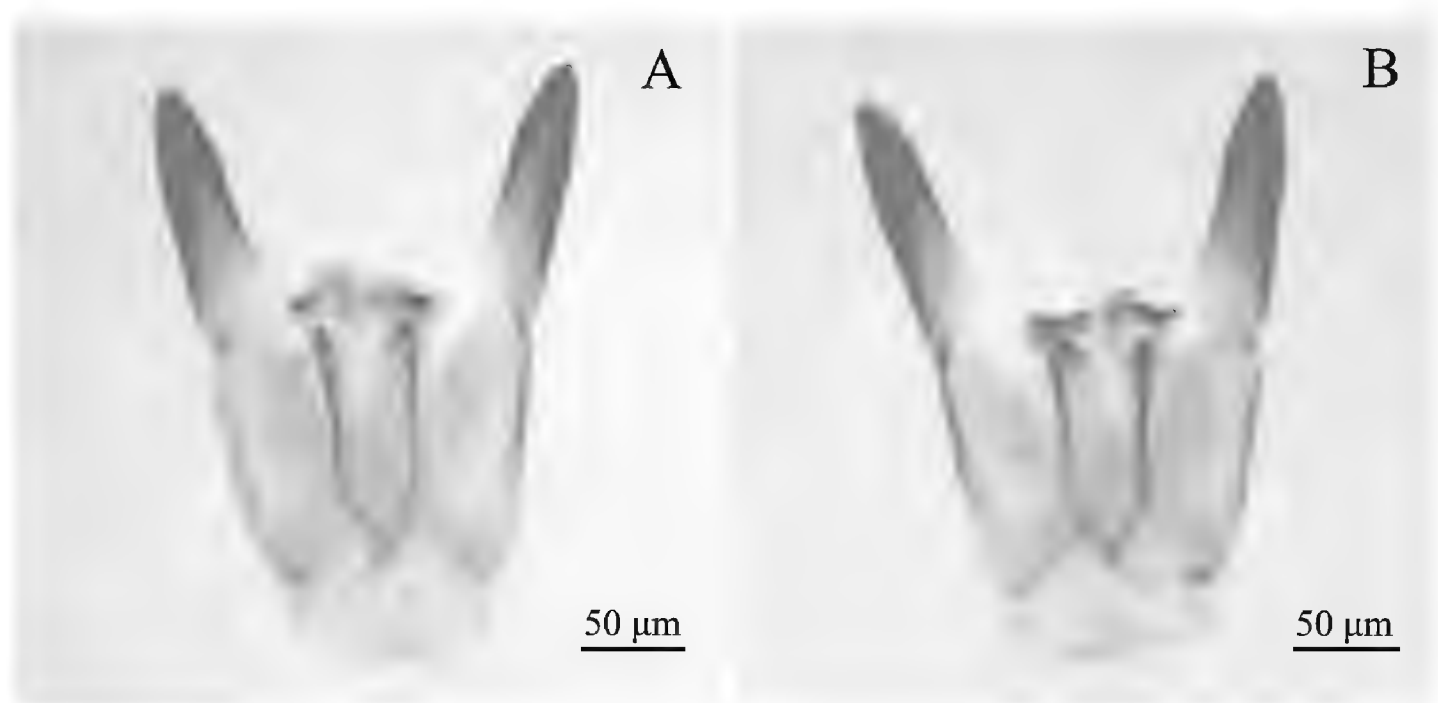


Figure 7. *Conostigmus electrinus* Wang & Chen, sp. nov., male, holotype, genitalia **A** dorsal view **B** ventral view.

***Conostigmus quadripetalus* Wang & Chen, sp. nov.**

<https://zoobank.org/F762DB57-97FA-405B-B413-1FED817117C0>

Material examined. *Holotype*: (AHNU) • male **CHINA:** Guizhou, Dabanshui National Forest Park, 939 m, 7–10.VI.2011, Dongdong Feng, SCAU 3045592. ***Paratypes*:** (AHNU) • male Guizhou, Dabanshui National Forest Park, 939 m, 7–10.VI.2011, Dongdong Feng, SCAU 3045591. (SCBG) • 2 males: same collection information as preceding, SCAU 3045590, SCAU 3045589.

Diagnosis. This species is distinguished by the following combination of characters: preoccipital lunula present; preoccipital carina present; preoccipital furrow present and preoccipital furrow ends posterior to ocellar triangle; antennal scrobe present; mesoscutellum length almost equal to wide, and not limited by a u-shaped carina; Sternaulus elongate and exceeding $2/3$ of mesopleuron length at level of sternaulus; gastral carinae present and reaching $1/3$ of syntergum length; distal margin of male S9 shape: convex; proximolateral corner of male S9 shape: blunt; distal margin of harpe blunt or straight; distal margin of harpe in lateral view acute or pointed; harpe shorter than gonostipes in lateral view; 4 gonosticulus spine and one spine more than $2 \times$ as long as the other (s).

Description. Male. Body length: 1.1 mm.

Coloration. Colour hue pattern: head and mesosoma black; metasoma dark brown; mandibles brown; palps yellow; scape yellow to brown, pedicel and flagellum brown; legs yellow; pterostigma, costal vein, radial vein and marginal fringes of wings light brown; body pubescence yellowish; male genitalia yellow. Color intensity pattern: petiole neck and anterior region of syntergite lighter than the posterior region of the syntergite; pedicel and F1 lighter than F2–F9.

Head (Fig. 8D, E). Head width, dorsal view: slightly wider than mesosoma (about $1.1 \times$ wider than mesosoma). Head width vs. head height: HW: HH = 1.1–1.3. Head height vs. eye height: HH: EHf = 1.5–1.7. Head height vs. head length: HH: HL = 1.2–1.4. Head width vs. interorbital space: HW: IOS = 1.6–1.8. Lateral ocellar length: ocular ocellar length: LOL: OOL = 0.5–0.8. Lateral ocellar length: posterior ocellar length: LOL: POL = 0.4–0.8. Ocular ocellar length: posterior ocellar length: OOL: POL = 1.4–1.9. Head smooth; head shape (anterior view): circular or triangular. Preoccipital lunula count: present. Preoccipital carina count: present. Preoccipital furrow count: present. Preoccipital furrow anterior end: preoccipital furrow ends posterior to ocellar triangle. Occipital carina count: present. Occipital carina structure: complete and crenulate. Intertorular area count: present. Intertorular carina count: present. Median process on intertorular carina count: present. Median process on intertorular carina shape: acute. Median region of intertorular area shape: flat. Antennal scrobe count: present. Facial sulcus absent. Facial pit absent. Ocellar foveae distinct, and ocellar foveae width less than ocellus diameter.

Antennae (Fig. 8A). Scape length vs. pedicel length: 3.0–4.2. Scape length vs. F1 length: 1.2–1.5. F1 length vs. pedicel length: 2.3–2.7. Longest male flagellomere: F1. F1 length vs. F2 length: 1.1–1.2. F4 length almost equal to F6. Length of pubescence on flagellomere vs. flagellomere width: flagellomeres width about twice than pubescence length.

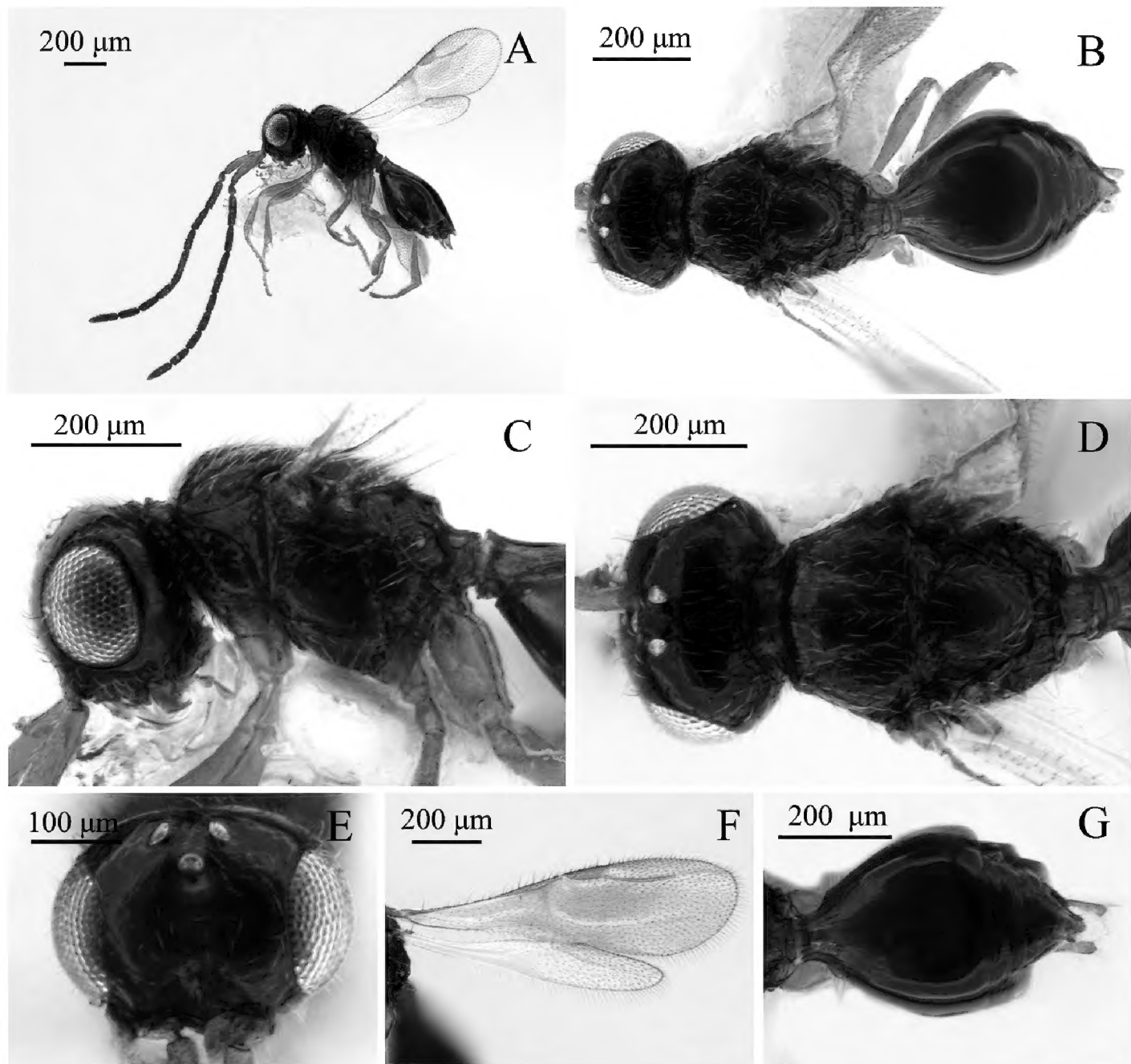


Figure 8. *Conostigmus quadripetalus* Wang & Chen, sp. nov., male, holotype **A** lateral habitus **B** dorsal habitus **C** head and mesosoma, lateral view **D** head and mesosoma, dorsal view **E** head, anterior view **F** wings **G** metasoma, dorsal view.

Mesosoma (Fig. 8C, D). Mesosoma slightly narrow ($1.4 \times$ longer than wide) (Length/width/height = $403/263/293 \mu\text{m}$). AscW/PscW = $0.7\text{--}0.9$. Mesoscutum $1.85 \times$ wider than long (Length/width = $158/293 \mu\text{m}$). Transscutal articulation evident. Notaulus count: present and complete. Notaulus posterior end: adjacent to transscutal articulation, posterior end of notaulus contracted but not adjacent to median mesoscutal sulcus. Median mesoscutal sulcus count: present and complete. Median mesoscutal sulcus posterior end: adjacent to transscutal articulation. Scutoscuteellar sulcus count: present. Scutoscuteellar sulcus vs. transscutal articulation location: adjacent. Scutoscuteellar sulcus shape: scutoscuteellar sulcus angled medially, foveolate. Mesoscutellum length almost equal to wide, not limited by a u-shaped carina. Sternaulus count: present. Sternaulus shape: elongate and exceeding $2/3$ of mesopleuron length at level of stermaulus. Mesopleural sulcus shape: straight. Pleural pit present. Lateral propodeal carina shape: inverted “Y”. Antero-median projection of the metanoto-propodeo-metapecto-mesoplectal complex absent.

Wings (Fig. 8F). Forewing length: 0.8–1.0 mm, translucent. Forewing macropterous with apex extending past petiole. Forewing with transparent stripes and dense pubescence (stripes without pubescence). Pterostigma semi-circular, length vs. width: 2.7–4.4. Radius (200 μm), a little curved, longer (1.4 \times) than pterostigma. Hind wing without vein.

Metasoma (Fig. 8G). Metasoma 1.6 \times longer than wide (Length/width/height = 508/321/252 μm). Transverse carina on petiole shape: concave. Syntergum smooth, longer (1.1 \times) than wide. Gastral carinae present and reaching 1/3 of syntergum length. Syntergal translucent patch count: present. Syntergal translucent patch shape: elliptical. Rest of tergites smooth, but with sparse hairs.

Male genitalia (Fig. 9). Distal margin of male S9 shape: convex. Proximolateral corner of male S9 shape: blunt. Male S9 distal setal line/setal patch count: distal setae composing setiferous patch or patches; distal setae composing transverse setiferous line or lines. Submedial projections on proximal margin of S9 count: absent. Harpe shape: simple and not bilobed. Distal margin of harpe shape: blunt or straight (with a little raised). Distal margin of harpe in lateral view: acute or pointed. Harpe orientation: medial. Harpe length: harpe shorter than gonostipes in lateral view. Lateral setae of harpe count: present. Lateral setae of harpe orientation: oriented distally. Dense patch

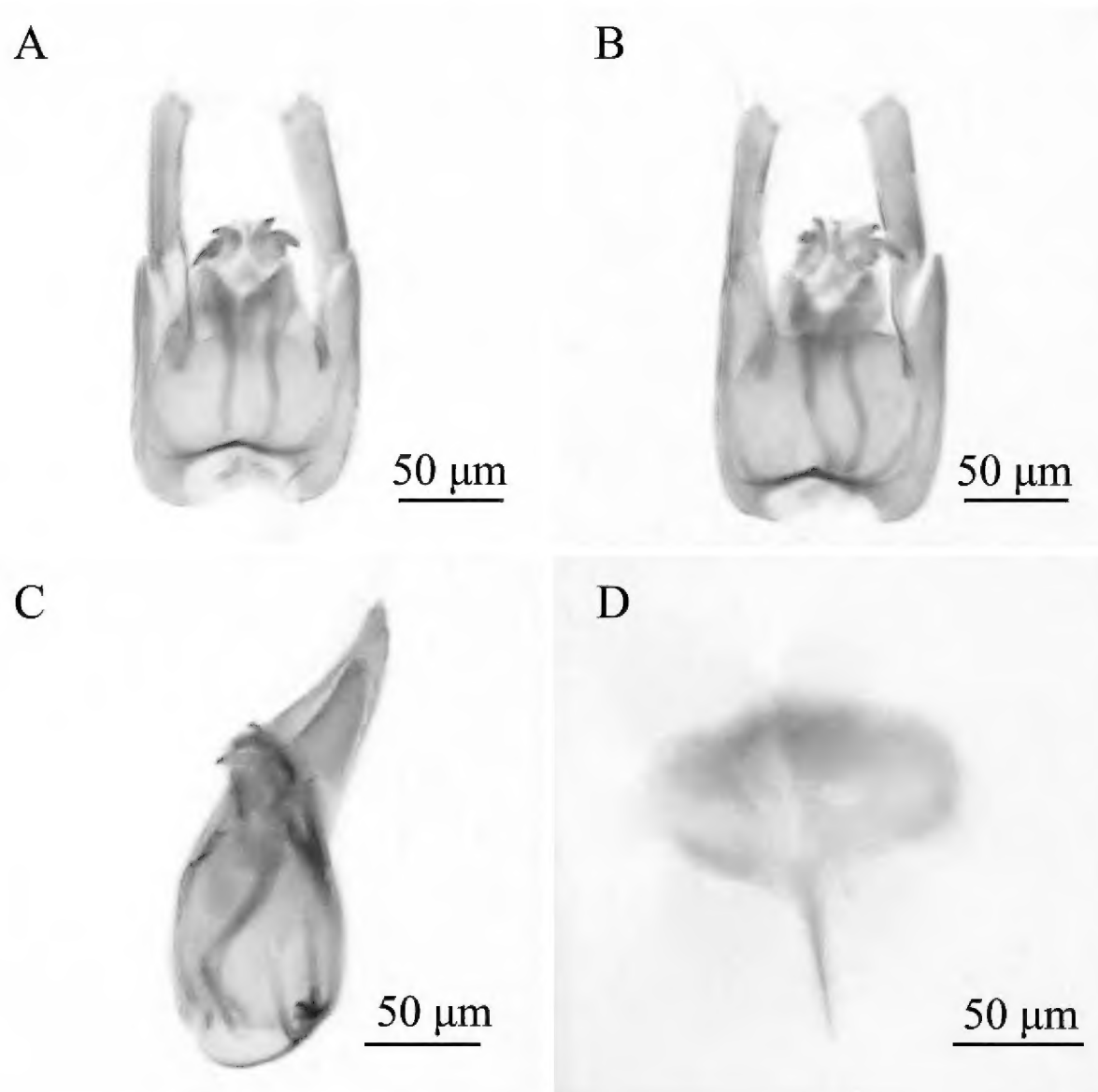


Figure 9. *Conostigmus quadripetalus* Wang & Chen, sp. nov., male, holotype, genitalia **A** dorsal view **B** ventral view **C** lateral view **D** S9.

of setae on the distoventral edge of the harpe count: present. Parossiculus count or parossiculus and gonostipes fusion: present and parossiculi not fused with the gonostipes. Gonossiculus and gonossiculus spine present. Gonossiculus spine count: 4. Gonossiculus spine length: one spine more than $2 \times$ as long as the other (s). Penisvalva curved and intersecting proximally.

Distribution. China (Guangdong).

Biology. Unknown.

Etymology. Consistent with the genus name, the species name is a Latin masculine adjective meaning “quadrifid”, indicating 4 gonossiculus spines.

Acknowledgements

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